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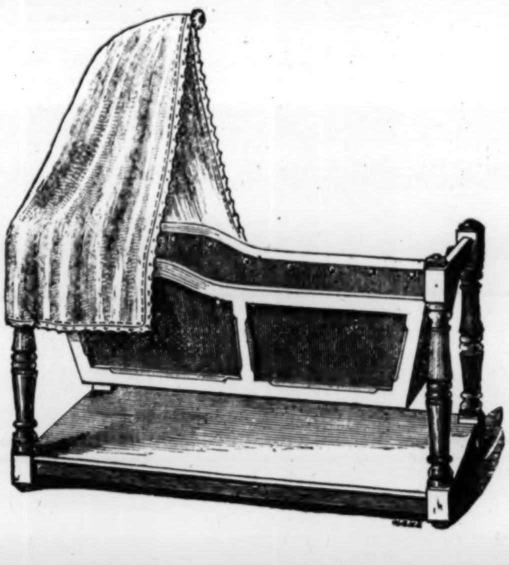
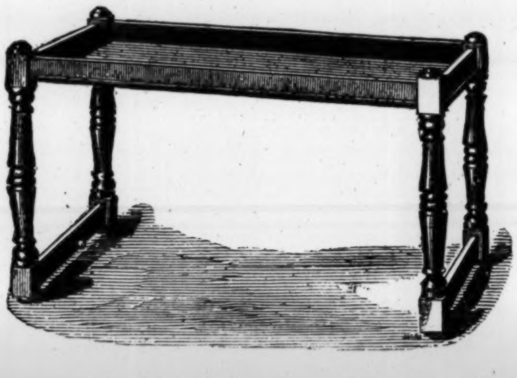
Yeast, &c.—A. P. Smith, A. S. Salamon.

*** *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

HANSELL'S COMBINATION COT.

This invention is a combined cot and stand which latter serves also as a table or platform. In carrying out the invention a stand is constructed provided with suitable projections or means for carrying the cot, which is hung or suspended so as to be free to swing on such centres. The cot is made of any suitable shape and form, and provided with means to hang to the projections or other arrangements on the stand, said cot being provided with rockers, which are attached free to be removed if required. The stand is so formed that when the cot is to be used by itself it can be disengaged from the stand, which stand can then be used as a table or stand.





Messrs. W. H. and L. Collingridge, of the *City Press*, are now in occupation of their new buildings, 148 and 149, Aldersgate-street, which have been erected upon the site of the offices destroyed by fire in April of last year.

Fine Drilling.—Professor Edward C. Pickering, of Harvard College, says that in undertaking to measure the intensity of the light of the satellites of Mars he had occasion to need an extremely small hole. Among the artisans who essayed to furnish what was required was one who had succeeded in making a hole edgewise through an old-fashioned three cent. piece, and another who had pierced a needle through from end to end. A hole about the twenty-five-hundredth part of an inch in diameter was finally secured.

Three Piston Engine.—Mr. James Hays Hagan, of Greenfield, Tenn., has patented an improvement in direct acting engines, in which three pistons are made to reciprocate in a single open-ended cylinder, and are connected with opposite cranks of a double crank shaft.

Reviews.

TABLES OF QUALITATIVE ANALYSIS.

"Tables of Qualitative Analysis." Arranged by H. G. Madan, M.A., F.C.S., Fellow of Queen's College, Oxford. Oxford: Clarendon Press. 1881.

These interesting tables are divided into two sets. 1. Analysis of single solutions. 2. Analysis of mixtures. Six tables under each of these heads. The intention of the author is to construct such a précis of analytical work made by the student who has carefully worked through courses of qualitative analysis. That the set of tables will be useful to students in analytical chemistry is beyond doubt.

THE LATIN VERB.

"An Easy and Rapid Method of Acquiring a Thorough Knowledge of the Latin Verb." Glasgow: David Wilson, 136, George-street. 1881.

This little work professes to be an attempt to simplify and shorten the study of the verb—the greatest difficulty to be overcome in the acquisition of the Latin grammar. The system carried out in these tables has been found to be of advantage to boys who have gained a thorough mastery over the subject in a much shorter time than is usually devoted to it, and no doubt others will find these tables as useful as they have been to the author.

RECENT AMERICAN AND FOREIGN PATENTS.

Machinery for cutting ice has been patented by Mr. Chauncy A. Sager, of Valparaiso, Ind. The invention consists in the combination with a traction ice-cutting machine of a peculiar laterally swinging cross-cutting device for cross-cutting the ice at right angles to the line of motion of the machine, and while the machine is in motion making longitudinal cuts. The frame of the machine is mounted on wheels and carries a vertically swinging arm having a longitudinally cutting saw attached, operated by suitable mechanism, also carrying a laterally swinging frame depending from a vertically adjustable frame and supporting a longitudinally moving revolving shaft with a cross-cut saw thereon, springs serving to control the longitudinal movement of said shaft. Devices are also provided for holding the pulley which drives this shaft in position and the cross-cut saw and its shaft in place for cross-cutting the ice while the machine is being propelled forward.

Sewing Machine Steam Guage. — Mr. William P. Brosius, of Richmond, Va., has patented a steam guage for sewing machines. The object of the invention is to provide a device which shall enable the operator to run subsequent rows of stitching in parallel position to and at regulated distances from the first; and the invention consists in a peculiar construction and arrangement of a guage composed of a spring arm with a stop or guide lug at its lower end, a horizontally adjustable slide carrying said arm, and a block adapted to be attached to the presser foot, which block is connected to the adjustable slide by a set screw and a rib or groove, which prevent the slide from turning axially about the set screw.

Packing Butter.—Messrs. Nathaniel F. Harris and Martin Theoni, of Monticello, Iowa, have patented an improved metal can for packing butter, &c., so constructed that air shall be completely excluded from the contents when the cover is soldered on, and so that the molten solder shall not heat the contents, and the cover can be easily unsoldered without injury to the can. The body of the can is formed with an outwardly flaring rim, and the cover also with a flaring rim. These rims are so arranged as to leave a space between them and form a groove for reception of a stripping wire which is soldered to the two rims, and serves to unite the cover with the body of the can.

White Lead Stacks.—Mr. James B. Pollock, of Port Richmond, N. Y., has patented a ventilating apparatus for white lead stacks. This invention consists in a combination in a white lead corroding stack or bed with the tiers of pots containing the lead and boards covering the same, of a board lining of the central ventilating flue made in sections, extending from the covering boards of one tier of pots to the bottom of the next tier, and in providing the flue with valves controlling the several tiers, whereby the ventilation may be regulated as required and the tan bark of the stock is prevented from falling into the flue.

Baling Press.—Mr. Charles W. Minear, of Kirksville, Mo., has patented a baling press. The object of this invention is to facilitate the compression of hay, cotton, straw, moss, and other substances into bales. In this press the baling box is mounted upon wheels for convenience in moving it from place to place. The power is applied to a horizontal sweep fast upon an upright shaft, and the connection with the follower made by a chain through the intervention of a cam having a sleeve fitting said shaft, a cam plate fast on the latter provided with a spring catch bar, which engages and disengages with the cam, and a lever pivoted to the follower and having a rocking fulcrum connection with the baling box. By revolving the upright shaft the follower is forced forward, and means are provided for automatically releasing, at each revolution of said shaft, the operating cam, which controls the follower chain, also for permitting of the follower being drawn back.

A improvement in tooth brushes has been patented by Mr. Louis Chevallier, of Brooklyn, N. Y. The object of this invention is to provide a brush with a reservoir for water to be used during the application of the brush. The invention consists in the peculiar construction of a brush having attached to its handle an elastic bulb or bag, that communicates with the bristle plate or face of the brush by means of a tubular passage formed through said plate and handle, the end of the tubular handle being extended to nearly the bottom of the bulb, whereby all the water in the bulb may be easily ejected when the brush is held with the bulb downward.

Reflector Lamp.—Mr. John Harvey Ludwick, of Dallas, Texas, has patented an improvement in reflectors for lamps and handles thereof. The invention consists in providing the lamp body with a flanged and recessed strip and the reflector with a projecting flange sliding into the recess of the strip, whereby the reflector is securely held in place and is readily detachable when desired. It also consists in a loop and catch connection of the handle of a reflector lamp with the reflector and body of the lamp, to admit of the detachment of the handle. This constructfon facilitates cleaning, repair, or renewal of the reflector, &c., also transportation.

Boot Polisher.—Mr. Alfred S. Clark, of New Orleans, La., has patented an improved machine for brushing and polishing boots and shoes on the foot of the wearer. The invention consists in a reciprocating rod provided with brushes at the sides and bottom and guided in the legs of a frame, to which a swinging lever is pivoted, actuated by a crank and intermediate cogwheels, and connected with the brush, which it reciprocates.

A pulverising attachment for ploughs has been patented by Mr. Tapley B. Maddux, of Denton, Texas. The object of this invention is to pulverise furrow slices as they are turned by ploughs; and it is particularly designed to lessen the draught in such devices by arranging the cutters at the top of the mould board in such manner as to offer but little resistance to the passage of the furrow slice. To this end the curved mould board of the plough has a bar secured to its upper curved edge, on which bar are fastened a series of cutters arranged to project upward and inclined or curved to the rearward, also formed with shoulders which rest upon the mould board. The cutters are sufficiently long to reach through the furrow slice.

Ploughs.—Mr. Armand Richard, of Grand Coteau, La., has patented an improvement in ploughs, in which provision is made for adjusting the blade of the plough, as it wears, by loosening a clamp bolt and removing the teeth of a clamp from notches in a flange with which they engage, after which the blade may be set farther forward. The clamp bolt does not pass through the cutting blade, consequently the latter is not weakened by a hole for the bolt.

Boiler furnaces, having for object the complete combustion of the fuel and gases in the fire boxes of steam boilers, evaporators, &c., have been patented by Mr. John Mailer, of San Francisco, Cal. The door of the furnace has a series of air passages through it, and the lining of the door is also made with a series of perforations, in which are inserted short stout metal tubes that project inward toward the door front. These tubes become highly heated and elevate the temperature of the air passing through the door. The bridge wall of the furnace is likewise provided with several rows of perforations, through which the smoke and gaseous products of combustion are restricted in their passage from the fire chamber to the combustion chamber.

Improved Cut-off Valve Gear.—Mr. John H. Blake, of Batavia, N. Y., has patented an improved cut-off valve gear. The invention consists of two slide valves, one at each end of the cylinder, each having a separate steam chest, into which steam is admitted throughout the whole stroke of the engine, the point of cut-off being regulated by rotary valves that are placed in supplemental steam chests over each slide valve; and it consists, further, of a hydraulic cylinder designed to be operated by water under pressure, provided with suitable valve and piston, which cylinder forms the connection between the governor and rotary or cut-off valves, and facilitates and regulates the action of the latter. The mechanism for operating the valves and the rotary valves are of peculiar construction, and among the advantages attained by this system of governing are the retention of the cut-off at any point it may have assumed, the slight strain thrown upon the governor, great sensitiveness of the latter, and nicety of adjustment to any point of cut-off desired, also the prompt and decided action of the cut-off devices.

Quarrying.—Mr. Adam R. Reese, of Phillipsburg, N. J., has patented a machine for quarrying slate and other rock. The object of this invention is to avoid that excessive waste of the rock, labour, and expense which is attendant upon the ordinary methods of quarrying, by the use of an improved machine for sawing and cutting the rock *in situ*. This machine is provided with a reciprocating travelling carriage having rotary saws or cutters for effecting the cut of the rock. The carriage is supported on a frame furnished with vertical screw threaded and sharp pointed legs for the purpose of adjusting the frame to different inclinations or levels. Screw adjustments also are provided for shallow or deep cutting by the saws. The machine is organised for cutting parallel channels in the slate or rock, and the saw teeth cut upward, so that the power applied to the cutting shall operate to hold the machine more firmly down in position. An engine is mounted on the frame for operating the mechanism which transmits the necessary motion to the saws, but it is designed that the motive agent, which may be steam compressed air, or gas, shall be furnished by suitable metal pipes and flexible tubes from a source which is independent of the machine.

Middlings Purifiers.—Mr. William Crye, of Walla Walla, Washington Territory, has patented middlings purifiers. The object of this invention is to keep free and clean the screens of middlings purifiers used in the process of manufacturing flour. To this end, the screen of the purifier has combined with it a reciprocating brush frame, the brushes of which act upon the underside of the screen. A rotating double-threaded rod, working in a double-threaded nut, gives the necessary reciprocating action to the brush frame, the nut being tilted at the end of each stroke for the purpose of engaging and disengaging alternately with the right and left hand threads on the rod.

Spray Motor.—Mr. Richard H. Atwell, of Baltimore, Md., has patented a spray motor, which is not restricted to a mere construction of parts, but includes a valuable principle of action. The invention consists in a method of increasing the effective power of rotary jet motors by commingling a gaseous and liquid medium to form a spray, and directing this spray against the periphery of a wheel or moving interior portion of the motor. Various kinds of gas may be used in concert with water to form the spray, and either the gas or liquid be energised. In either case it is claimed that a greatly increased result is obtained over or as compared with the use of air or gas alone or a liquid alone as the impelling agent. The invention also consists in certain constructions of different parts of a rotary jet motor for advantageously carrying the above principle into effect, the same including an inlet for a liquid medium and an inlet for a gaseous medium having a confluence at or before the point of impact against the wheel; also a wheel against which the spray acts formed of a disk with angular buckets projecting from the side of the same.

Harness.—Mr. James D. McAnally, of Waterloo, Ind., has patented an improved harness catch and cockeye for whiffletrees, &c. This invention, which is equally adapted for use upon neck yokes, bridle bits, water hooks, and in fact upon all parts of a harness where catches are desired, consists in a ferrule having an outwardly or endwardly opening catch, clipped away on its under side, in combination with a vertically inserted cockeye, capable of ready engagement and disengagement, and having its pintle protected from that.

Raising water from a well, cistern, or other receptacle, and conveying it to a distance and there discharging it, has been patented by Mr. James C. Richardson, of Boscobel, Wis. A wire track, inclining upwards, is extended to the curb of the well, &c., to the place of discharge, and on this track a carriage, controlled by a rope and windlass, is arranged to run. Connected with this carriage by spring bolts is a bucket carrier, which, on reaching the well, is automatically released, to allow for the descent and filling of the bucket, after which the bucket carrier is raised by a rope and made to automatically engage with the carriage, that is drawn up the track till the bucket meets with a tilting stop, which causes the water to be discharged.

A firing and tamping device for torpedoes, more particularly intended for use in oil wells, but also applicable to wells and drills of various kinds, has been patented by Mr. James E. Gallagher, of Olean, N. Y. This invention consists of a weight designed to be dropped upon the head of the torpedo in the well or drill. This weight consists of a shell of fragile and insoluble material, filled with sand and provided with a solid point, which, striking the head of the torpedo, explodes the latter and causes the sand, that by the explosion and destruction of the shell of the weight is liberated, to be retained in a compact mass above the exploding torpedo, thus tamping the charge and causing it to act laterally.

Pipe tongs, patented by Mr. N. Purdy, of Fall Brook, Pa., comprise linking the jaws of the tongs together at their outer ends, and linking one of the jaws permanently to the end of the handle or lever, the other jaw being adapted to be connected to the lever so as to grasp upon the pipe by means of a loop or similar device hinged or pivoted upon the end of the lever, and adapted to be placed over the end of the jaw.

A wrench, patented by Mr. W. E. Wild, of Lead City, Dakota Territory. The socket is provided with an interior adjustable section for adapting the socket to nuts of different sizes. The movable portion is provided with a rack which is engaged by a worm pivoted at the end of the handle.

An improved expanding mandrel that will hold the work firmly and truly, even under great pressure of the tool. It consists of a longitudinally ribbed and split sleeve, which is driven into the work and on to a tapered mandrel. This improvement has been patented by Mr. J. A. Wilde, of Hudson, N. Y.

Improved Lace Cutter.—The invention consists in a slotted or split handle having the cutter fastened to its outer end in such a manner that the cutting edge crosses the slot diagonally. Though the slot is an adjustable guage for regulating the width of the lace passes, and can be locked in any desired position by means of the binding screw.

An improved stove mat for coffee pots and other utensils has been patented by Elizabeth C. Zumwalt, of Port Orford, Oregon. The invention consists in a mat made of a plate of sheet metal, having apertures and a handle to adapt the mat to be placed upon the top of a stove to receive a coffee pot or other utensil, the object being to prevent the bottom of the vessel from burning.

Hop Poles.—Mr. Curtis Griffin, of Middlefield, N. Y., has patented an improved adjustable frame as a substitute for the poles in raising hops. The invention consists in an upright having two crossed bars, with two cross pieces at the end fastened to its top, which cross pieces have hooks at the ends to receive rings at the upper ends of a series of rods having rings fitting over the tops of a series of short posts around the upright, or on hooks at the upright, attached to their lower ends. The hop vines grow up on these rods, and the latter need only be unhooked when the crop is to be harvested.

An improved wagon brake has been patented by Mr. Robert Rutter, of Dillon, Montana Territory. The object of this invention is to facilitate the reversing of the brake roller, to allow the brake lever to be placed at the left-hand side of the wagon when the brake is to be put on by a man riding the near wheel horse, and to be placed at the right-hand side of the wagon when the brake is to be put on by the driver riding in the wagon.

Brake Rod.—Mr. Edward Ebi, of Cedar Rapids, Iowa, has patented an improved brake rod. The invention consists in a rod passing through journal bearings on the under side of the car, and provided at the ends with pivoted connecting bars having spring catches for keeping them united, which connecting bars are locked to the brake rods by means of a lever pivoted to the connecting bar and passing into notches of a loose and a rigid circular plate on the brake rod, so that all the brake rods of the several cars of a train will be revolved together and the brake shoes will be drawn against the wheels simultaneously.

Harrow.—An improved harrow has been patented by Mr. William J. Campbell, of Reed's Gap, Pa. The object of this invention is to provide means whereby the centre bars of the harrow may be weighted by the side bars and thus caused to make deeper cuts; and also to provide a harrow the tooth bars of which may be readily detached from each other for convenience in transportation and stowing away.

Grain Meters.—Messrs. Reuben R. James and Mirabeau N. Lynn. of Rising Sun, Ind., have patented an improvement in grain meters. This invention relates to apparatus for weighing and measuring the amount of grain that passes through it by devices actuated solely by the weight of the grain, and hence automatic in its operation. The invention is an improvement on the grain meter for which Letters Patent were granted to the same inventor February 22, 1881, No. 238,122.

Wood Preserving.—Mr. Bat Smith, of Spanish Camp, Texas, has patented an improved composition for preserving wood, consisting of eight parts of coal tar, one part of crude carbolic acid, and three-fourths part of crude pyroligneous acid, mixed and heated, but not permitted to boil. The wood to be treated is placed in a vessel filled with the compound, where it remains until saturated.

Rock Drill.—Messrs. John Greek and Francis M. Sellman, of Evansville, Ind., have patented an improved expanding rock drill for cutting a recess or cavity at the bottom of a drilled hole in a rock, or a coal or other mine, for the purpose of receiving the charge of powder or other explosive substance used in blasting. The invention consists in a novel combination with a drill rod or holder, of a pair of bits or drills, and the combination therewith of a cone of peculiar construction for expanding the bits or drills.

An improved mail bag catcher has been patented by Mr. Calvin I. Kimball, of Portland, Me. This improvement relates to apparatus used on mail cars for catching mail bags, and have for their object to allow adjustment of the crane to the direction in which the car may be moving without removing the crane from its supports.

An improved tire tightener has been patented by Mr. Russell Jennings, of Sedalia, Mo. This invention relates to the class of tire tighteners which consist in a threaded bar or screw having a vertically movable clamp and a nut, by which with the assistance of a winch, the said clamp is brought to bear against the fellies, and thereby separates the fellies from each other and from the spokes, where they have shrunk, the space thus created being filled with wedges.

Improved Brooch.—Mr. Carl A. Türpisch, of New York city, has patented an improved brooch formed of a wire bent in the form of a ring or in a similar manner, so that the two ends will be pressed against each other by the spring of the wire. To one of the ends a cap is attached in such a manner that it overlaps the point of contact of the ends of the ring, upon which ring a short sleeve is loosely mounted, and has a pin attached to it, this pin being passed through the article to which the brooch is to be attached, upon which the end of the pin is forced through between the ends of the wire into the cap, in which it is retained as the ends of the ring snap together, thus locking the point of the pin between the cap and the ends of the ring.

An attachment for seed drills has been patented by Mr. Howard M. Fordham, of Great Bend, Kan. The attachment has a rotary shaft with spirally arranged rods attached to the shaft which pass between the drill feet and push off collected rubbish, and springs are placed upon the rods to keep them clear of rubbish.

An improved astronomical clock has been patented by John L. Blair, of Clear Springs, Md. This invention relates to certain improvements in what are known as "astronomical clocks," designed to show by object-lesson the minutes and hours of the day, the day of the week and month, the daily revolution of the earth, the yearly revolution of the earth, the phases of the moon, the time for the different longitudes on the earth, the lunar revolution, the signs of the zodiac, the tides, and synodical as well as periodical time.

Umbrella Frames. — Mr. Theodore D. Lockling, of San Mateo, Costa Rica, Central America, has patented an improved method of securing covers to umbrella frames, so that they can easily be changed at will. The invention consists of the combination with the handle and notched and perforated ribs of an umbrella, of elastic rings, clamps, clips, and loops.

An improved watering pot has been patented by Mr. George F. McIntosh, of Hallowell, Me. The object of this invention is to facilitate the convenient changing of the delivery nozzles of the pot and prevent waste of water in supplying potted plants. The watering pot is provided with a closed top, upper and lower orifices to receive changeable nozzles, and a filling aperture and funnel on the rear above the handle.

An improved table-leaf support has been patented by Mr. Horatio J. Locke, of Belfast, Me. The main object of this invention is to improve table-leaf supports so that the spring will only be allowed to exert its greatest power when supporting the leaf.

An improved winding roller for looms, &c., has been patented by Mr. John Connelly, of Hallowell, Me. This invention relates to cloth-winding rollers used with looms to receive the cloth, and paper machines for winding the paper, and in winding web of other material, the object being to allow convenient removal of the material after being wound.

Journal Bearings.—Mr. Jacob G. Titus, of Silver Cliff, Col. has patented an improvement in that class of journal bearings in which friction is relieved by use of balls or rollers interposed between the journal and its box or casing. The improvement consists in the construction of an axle journal box which adapts it to receive anti-friction balls, and also in the provision of elastic and anti-friction end bearings for receiving the end movement or thrust of the axle journal.

An improved cornstalk shocker and binder has been patented by Mr. John B. Whitbeck, of Coxsackie, N. Y. The invention consists in a roller supported by standards and carrying a transverse bar and a cord for drawing the stalks together to be bound. After binding the shock the roller and transverse bar may be removed.

Soap.—Mr. Adrian C. Selby, of Covington, Ky., has patented an improved soap composed of tallow, olive oil, sal-soda, unslaked lime, rosin, borax, alum, white wax, spermaceti, and benzine.

Crochet Goods.—Anna M. Knoop, of New York city, has patented an improvement in crochet goods, which can be used as hat frames, book satchels, sewing baskets, &c. The invention consists in an article of crochet work which is stiffened by means of glue, gelatine, or similar substance, is then dried on a mould, which gives it the desired form, and is then protected with a suitable varnish.

Trap.—Mr. John L. Symonds, of Detroit, Mich., has patented an improved trap formed of two trough or tray shaped wire netting sections hinged to each other and pressed toward each other by spiral springs on one of the sections. The trap is provided with a bait hook having a catch at the upper end, which catches on a bail of the other section and holds the sections separated; but as soon as an animal bites on the bait the bail is released and the springs force the two wire netting sections thus entrapping the animal.

Machinery for winding silk has been patented by Mr. Henry H. Bartlett, of Watertown, Conn. The object of this invention is to soften raw silk and prevent generation of electricity in boiled silk during the process of winding. The invention consists in providing the winding machine with a steam generator for dampening or moistening the silk by a spray of steam, whereby the gum on the raw silk is kept soft, and in the case of boiled silk it is rendered flexible while being wound, and the generation of electricity is prevented. The steam generator for effecting these results is arranged below the swifts of the machine, and is provided with perforations in its upper side for the distribution of steam to the silk on the swifts.

A new fluid pressure regulating valve has been patented by Mr. William M. Sloane, of Brooklyn, N. Y. This invention relates to that class of valves for regulating the pressure of gas, steam, air, or other fluid, or, rather, for delivering such fluid under a uniform and reduced pressure from a reservoir thereof under high pressure, which usually consist of a valve opening against the high pressure and a diaphragm tending to keep this valve open, while the pressure admitted through the valve on one side of the diaphragm tends to keep the valve closed, which actions and reactions cause the gas to be delivered uniformly under the desired pressure, according to the adjustment of the diaphragm.

An improved cushion has been patented by Mr. William T. Doremus, of New York city. The object of this invention is to prevent the displacement and the packing of the stuffing in cushions for beds, lounges, chairs, and other articles of furniture. The invention consists of a cushion made of two or more small elastic parallel rolls connected along their adjacent sides, whereby the elastic material forming the stuffing is kept from being displaced and becoming packed.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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F. W. CAMPIN, Sec.

SESSION 1880—1881.

Ordinary Meeting, December 9th; Council Meeting, December 30th.

Monthly Notices.

Mr. William Crookes, F.R.S., whose interesting researches on the action of matter in extreme vacuo are well known, has devised a method for the manufacture of carbons for electric lamps. The processes described would occupy too much space, but the result is carbon entirely free from any inorganic ash, and the production of a vacuum of the most perfect kind, in which the luminous carbons will last much longer than in the vacuum obtained in the ordinary way.

Prof. Virchow was honoured by a banquet in the Rathhaus at Berlin on the 19th ult. On the same day a marble bust of the professor was placed in the hall of the Pathological Institute in commemoration of his twenty-five years' labours as a teacher of medical science. At the same time a fund, to be called the Rudolph Virchow foundation, was formed by subscription, for the promotion of scientific investigations which will increase our knowledge of man.

A New Society founded in Japan for the investigation of volcanic and earthquake phenomena, and called the Seismological Society of Japan, has just issued the first volume of its *Transactions* (Yokohama, *Japan Gazette* office). This contains an inaugural address by Prof. Milne, the Vice-President of the Society, in which the results of past investigation into seismic phenomena are mentioned and the future work of the society mapped out. New instruments for recording the direction and intensity of earthquake shocks form the subjects of papers by Messrs. Gray, Ewing, and Wagner. The most important, as well as longest, paper in the volume is one by Mr. Milne on an earthquake which took place in the neighbourhood of Tokio on February 22nd, 1880, and which seems to have been the most severe and destructive experienced since the country was opened to foreign intercourse. At the time of this occurrence instruments for observing had fortunately been established at many places within the area of the shock; the native police and other officials also communicated their own observations as to the time, direction, &c., of the earthquake. The number of records, scientific and otherwise, at the writer's disposal were, therefore, numerous, and he has been able to give the history of an earthquake from the sudden jar which gave it birth until, spreading outwards in ever widening circles, its energy and motion were dissipated. Mr. Milne's observations on the effects of earthquakes on buildings and the manner in which houses should be constructed in order best to resist the shocks are of much practical importance in earthquake countries. On the whole, the society may be said to have made an excellent start. It is gratifying to see some of the science which Japan has borrowed from the west returned to us in this form.—*Athenæum.*

The Report of the Free Library at Cambridge announces a large accession of books and the largest issue of books since the institution was opened.

The Conservatoire des Arts de Metiers is now placed under the Department of Trade and the Colonies, and transferred to the direction of the Minister of Fine Arts, obviously for the purpose of developing technical science amongst French working men.

The French Society for the Encouragement of National Industry offer for 1882 a prize of 1,000 francs for an industrial application of endosmose of liquids. M. Dubrunfaut has successfully treated molasses by endosmose. Alcohol has been concentrated by it, and the processes of tanning improved. The society desires to encourage researches in these directions.

Rapid Analysis of Fire-damp.—M. Monnier at the last meeting of the Paris Society of Engineers described his "méthano-mètre automatique," for the rapid analysis of fire-damp. The instrument is founded on the fact that hydrocarbons with an excess of air and under the influence of a high temperature are decomposed into steam and carbonic acid.

Dr. Ami Boué has recently died at Vienna at the advanced age of eighty-seven years. It is stated that M. Boué has published more than two hundred works on geology, natural history, and geography. Since 1848 M. Boué has been a member of the Academy of Sciences of Vienna. M. Ami Boué in 1829 was elected Honorary Member of the Geological Society of London, and he was a recipient of the Wollaston Medal in 1847.

THE SCIENTIFIC REVIEW
AND
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DINNER OF INVENTORS.

THE dinner for members of the Inventors' Institute and friends of the inventors' cause was held at St. James's-hall on Thursday evening, Dec. 1st. The chair was occupied by Sir ANTONIO BRADY, President of the Institute.

The CHAIRMAN.—The first toast I have to propose is one that commends itself to the hearts of every Englishman. I do not think there is any other country in the world more proud of toasting such a Royal Family than we are. I do not believe in the whole history of the world that we have ever had a more glorious Sovereign than we have the privilege of being ruled by, and I hope and trust her family will follow in her footsteps, and that we shall long be reserved to see one of the most glorious dynasties ever known.

The health of the Queen and Royal Family was duly responded to.

The CHAIRMAN—The next toast I have to propose is the Army, Navy, and Reserve Forces. We are proud of our Army and Navy and Reserve Forces, and happily in this country they are all Volunteers. We have not the privilege of any Army men here to-night, but we have the honour of having amongst us one of our distinguished Admirals. He is not only an Admiral, but was a Captain of Volunteers also, and I will ask him to respond on behalf of the services.

The Toast was drunk with all honours.

Admiral SELWYN said the Navy ought to be most grateful to inventors, for their inventions had been so skilful in modern days that they had nearly driven the Navy off the water. In fact they had been attacked below water and above, and it was doubtful whether the end of a great naval action would not be that the vessels composing the fleets would all descend to the old gentleman called "Davy Jones." With regard to the other services he was not so competent to return thanks. No doubt they appreciated the enormous advantages of shooting and being shot at at longer distances, and still further the advantage of carrying a larger number of waterproof cartridges, but above all the power of getting a good ration at a very small price and very portable. Modern inventions had given to the soldier the power of carrying his grub in his pocket, and those who knew what it was to come in after a hard day's march without the prospect of getting anything to eat or still less a chance of shelter from the pouring rain, would understand the gratification it was to fill their insides if they could not protect themselves outwardly. As to Volunteers, they had not yet undergone any great hardships. Some years ago some of the volunteers thought he put them to a very great hardship in making them sit down on their heels, when he was raising and drilling a Volunteer Corps in Westmoreland, and when he at last got one man that could do it well, he said he could sit there till next morning. He found for the first time that he had a heel to sit upon, and it was a great invention for him. Volunteers, however, had gone far beyond that, and there was a deep scheme on foot to assimilate all the volunteers, whether army or militia or volunteers. Those who guide the British public saw there was really no great difference between them, that they were all volunteers—the Army and Navy volunteer, and the volunteers volunteer; and there was no great reason to dread that, duty being a feeling common to them all, their duty and pleasure alike would be to defend their country, which no doubt they were ready to do. The idea had been started of bringing regiments of militia into close contact with regiments of the line, and no doubt eventually the volunteers would be brought into close contact with the militia, so that we should have a united force to defend us against all comers, yet scarcely utilisable abroad to carry out any schemes of aggrandisement which might have been formerly the right political game to play, but which to-day in the comity of nations seemed known to be a political error. He should urge upon the inventors of this country not to think that we had come to any finality. The Government had accepted a certain arm which might be thought to be the best that could be produced, but he hoped inventors would demonstrate the contrary. The guns were being constantly enlarged, and remarkable progress had been made within the last two or three years by adopting a system which had been persistently advocated by an able mathematician for getting the greatest tensile strength round the gun: he spoke of Mr. Longridge, C.E., who had by working out a fact known to every one who studied the conditions of tensile strength, discovered that by winding steel wire or bands on the interior tube he largely increased the strength. And that the steel, which in its ordinary state only resisted a tensile strain of forty tons to the inch, by drawing down into wire was made to resist a strain of 130 tons; and that had been taken up, though late, yet wisely, by Sir William Armstrong, who had adopted it in the making of his guns. He hoped we should see our way towards giving up the idea of using weak powder in weak guns, and that we should begin for the first time to appreciate what might be done by strong guns and strong powder. With regard to armour for ships a similar advance had been made. For years we used an enormous thickness of comparatively weak wrought iron. At last it came to be believed that blacksmiths who used an anvil with a steel face were not quite wrong, and we began to use steel faces to our armour, with the result that we accomplished the same resistance with about two-thirds the original weight. It ought to encourage inventors to know what they could do to benefit the country. They ought to keep the army in a position second to none, and while making them more efficient they could safely reduce the expenditure at the same time. It was the province of Statesmen to regulate the way in which fiscal burdens were imposed, but it was the province of the inventor to do away as much as possible with the necessity for such burdens. He thought if they made clever inventions in the right direction, and contributed by wise Patent Laws to a due investment of capital in inventions, they would reach at last that most desirable time when the perfection of the weapons of war would lead to the cessation of war and therefore of the taxation necessary to prepare for war.—(Cheers).

The CHAIRMAN—The next toast is our Houses of Legislature, and we have here to-night a very distinguished member of the House of Commons—(Hear, hear). I couple Mr. Broadhurst's name with this toast; and I ask him to return thanks for the chamber he represents. No doubt Mr. Broadhurst represents a class, and we, as inventors, feel that we are about to enter upon a new session of Parliament from which we look for legislation at the hands of able men. I believe that there is no possible home question which can be passed by the House of Commons comparable in importance to that subject which is of interest to inventors. Mr. Broadhurst has paid great attention to the subject, and his name is on the Bill which will be before the House next year. The Society of Arts have given great attention to the Patent Laws, and there was no question on which the advancement of our country depends more than to have good Patent Laws. Unless we cultivate the brains of our people and reward those who exercise their brains by granting them the power of securing their inventions, which will redound to their honour and advantage, I think England may say good-bye to her trade and commerce. I believe in the Anglo-Saxon race, and I am certain that if you give our artisans and people the same advantages of education and technical knowledge as do foreign nations, then we may bid defiance to the whole world—(Hear, hear). I believe our race equal to any of the races of the world if you give them the same opportunities which this Institute is seeking to confer. Therefore I hope you will encourage this institute by every means in your power; and men like Mr. Broadhurst also, who advocate in Parliament the claims of inventors to show that their claims are not those of monopolies, but that they are for the advantage of the common country, by giving us possession of those means of production. I will ask you to drink this toast, and couple with it the name of Mr. Broadhurst.

The toast was drunk with all honours.

Mr. H. Broadhurst, in acknowledging the compliment, said it was a very great honour to be called upon to respond to the toast of the House of Commons in such a learned and distinguished assembly as that before him. The House of Commons was an institution of which all English citizens might well be proud—(Hear, hear). Like all other institutions, however, it had its fault, and sometimes by the exercise of its great liberty in the hands of one or two individuals, it exhibits its folly—(Hear, hear). It was an institution above all others which every constitutional-loving citizen in this county, of whatever party, should guard with jealousy, and watch its liberties and its position with great anxiety indeed. Recently that House had been engaged in passing great and, he trusted, beneficial legislation for Ireland. He had the fullest confidence that when the Irish people had had time and opportunity to realise the intention and the beneficence of that law, it would go far to restore order and confidence between the Irish nation and the English people. They had, however, to regulate the machinery or House, so that it would be no longer possible that in the name of liberty one or two individuals should be able to act the despot over that great assembly—(cheers)—thus attempting to bring it into ridicule and successfully obstructing wise and necessary legislation for the benefit and progress of our common country—(Hear, hear). Having accomplished that which he believed the House would on assembling next year, he trusted they would be able early to apply themselves to that subject which was interesting to inventors—viz., the reform, the simplification, and the cheapening of our Patent Laws—(Hear, hear). He took a line in that direction last session, when they had one of the best homely debates of the whole session on any private Bill: he meant on Mr. Anderson's Patent Law Reform—(Cheers). And that illustrated the strength and the business capacity of the House of Commons when it really got to work without being disturbed by nonsense—(hear, hear)—namely, that it could apply itself to the discussion and the redress of legitimate grievances. Mr. Anderson's Bill was tabled and three or four hours' debate on it ensued; and the only serious divergence of opinion from his proposals was given utterance to by a representative of the Government, Mr. Chamberlain. But the President of the Board of Trade, through the pressure of business in his department, was compelled to speak early in the debate, immediately after Mr. Anderson; but had he spoken later, he (Mr. Broadhurst) ventured to think his speech would have received many important modifications—(Hear, hear). There was a uniformity of opinion from all sections and parties in the House that Mr. Anderson's Bill had made out a clear case, and that reform was imperatively called for; and when they had convinced an assembly that reform was necessary, it was only a question of time and quantity as to how soon or much would be obtained—(Hear, hear). He had the greatest confidence that next session there would be a Government proposal on Patent Law reform—(Cheers). But he feared they would not get so liberal a reduction in the fees in the cost of patents as they might desire. They would, however, press the Government to make the fees lower; but above all they should endeavour to assist in passing any Bill that dealt thoroughly with the whole question of Patent Law reform, and if they could only reduce the difference between the Government and themselves to a question of the cost of patents, it would be comparatively easy in the next session to make proposals to introduce a Bill of one clause to deal with that part of the matter—(Hear, hear). Once having obtained that admission, the rest of the work would be easy. They were old enough to know that in English politics the first requisite was to agree upon a common basis and then get as much constructed upon that basis as possible at one time, and never miss an opportunity of adding another storey to the building—(Hear, hear). It was a remarkable sign of the times that the great representatives of labour from all parts of the United Kingdom had at their last three congresses asked Government to so alter the Patent Laws as to give every facility to inventions and increased machinery for the production of manufactured goods—(Hear, hear). While workmen had been labouring under the taunt of being opposed to machinery, there was a ready contradiction—(Hear, hear). They were asking Parliament to give protection and encouragement to remove every obstacle to the path of invention. They did not want encouragement from the Government for any one thing; all they asked was for the removal of obstacles from the path of progress—(Hear, hear). When the Bill was before the House it would be the duty of all interested to take hold of it, and if it were not satisfactory to tell the Government so and to point out where it required amendment, and, if possible, with a strong front and a good cause, demand that they should so alter it that it would be made to meet adequately their requirements; and if they could not at first get all they wanted, to repeat their application on the next opportunity He was convinced that the greatest mistake a nation could make was to hamper or fetter the inventive genius of its people, and that every inventor in any country who developed wisdom and genius in that direction was a great national acquisition, and should be guarded in proportion as that nation would guard a discovery of gold or iron ore, or a bed of diamonds—(Hear, hear). Depend upon it, there was a great man who would prove the secret of the power and fitness of wealth if the nation would only encourage him—(Hear, hear). From Mr. Anderson had also emanated a proposal during the session for the further promotion of technical education in our country, which had partly succeeded. There was now on the continent a Royal Commission making investigations for the purpose of reporting and advising the Government upon the best means of developing technical education amongst our people. Well, that was part of the subject to which they as inventors referred, and showed how closely they were related. Culture in the childhood of our boys, and invention followed naturally thereafter—(Hear, hear). They might depend upon it that although their progress might be slow, it was as certain as the day succeeding night that England would yet continue to lead the van of nations in the sound growth of honest and, he hoped, profitable productions of manufacture—(Loud applause).

Mr. F. W. Campin, F.R.S.L., Barrister-at Law, Secretary of the Inventors' Institute, in proposing the toast, "The Inventors' Cause," felt that his duty would be easily and quickly effected, which as he was still in a bad state of health would be to him a boon. Sir Antonio Brady had so fully acknowledged that invention was of the greatest value to the country, and therefore ought to be supported by the Government of the day, that little further need be said. He felt too unwell to make a speech, though his head and heart were full of this matter. All he could say was that he felt sure they would do ample justice to the toast, which covered a subject which lay nearest and dearest to their hearts—(Cheers).

The toast was duly honoured.

Mr. C. E. Spagnoletti, in speaking to the toast, declared it demanded more consideration than he had had the opportunity of giving to it. He did not know whether there was anything more conducive to the cause of the inventor than the subject of Patent Laws. He considered speedy reform of them was necessary. The present cost of patents was excessively higher in this country than in others. The system of having a six months' provisional specification was defective. That amount of time for men engaged in business as they were was wholly inadequate. It did not allow sufficient time to develop and carry out to the fullest extent the advantages that their patents might possess—(Hear, hear). It was found also in practice that six months only allowed a portion of the time that was requisite for developing a patent. As soon as operations were commenced numerous improvements were discovered of the most important nature, and until they had enjoyed personal experience of the cause and effect of their patents, they were not prepared to set down what was wanted. Therefore, in considering the amendment of the law, if there could be such a system whereby certain additions could be made to specifications or allowed to alter and revise and bring in the improvements which practice had given the opportunity of discovering, it would be a very great boon—(Cheers). At present they found if they took out a patent they worked it out to a certain extent, and then they found the limited time at their disposal prevented them adding to it, and then they were put to great expense for nothing. Then the country which took their fees to protect them from intruders should effectually do so—(Cheers). If a man applied for a patent and certain ordeals had to be gone through, they should be final. It was unfair, after a man had paid his money for protection, that he should be called upon to incur great expense in lawsuits to show what had been done to infringe his patent—(Hear, hear). First they should not be trespassed upon, and those who trespassed should be warned off the ground, and then they should accept the consequences of their own faults—(Hear, hear). He thought some caution should be given. The patent might be made certain, and whether a matter of consideration and arbitration or anything else, a warning ought to be given to all trespassers as to what they were doing. With regard to patent agents, there were many of them who would do a great service to the inventors if they were better prepared to say what patents had been issued, &c. If a person went to a lawyer about property, the lawyer was for a time responsible. Why should not a patent agent study the progress of patents as a lawyer does the progress of law, and so be able to advise whether a person was doing what was right or wrong. He had no doubt that if the promised measure contained that which would reduce the cost of patents and advance upon the lines on which he had spoken, the greatest help to the inventor's cause would ensue. No doubt a certain amount of instruction was necessary in the selection and registration of patents, as he had seen many patents that no man could for a moment recommend a penny to be spent on them—(Cheers).

The Chairman.—We now come to what I may call the toast of the evening, and I ask you to drink success to the Inventors' Institute. We have amongst us many men who have done much for inventors; amongst others, Mr. Coles, who is organising the international exhibition for the prevention of smoke, which gives an opportunity to inventors for displaying to the whole world the wonderful scientific means there is for doing away with that intolerable nuisance of smoke. The opinion is that we are afflicted with this incubus of smoke, which damages our health and destroys our property; and the man who shows how to rid us of the nuisance, and at the same time to save 25 to 30 per cent. in fuel, deserves well of his country. I believe the Government will shortly have to turn its attention to the alteration of the law called the Sanitary Act. It places in the hands of people who break the law the means of redressing the law; and I think we should at once come to a decision, as the subject affects not a few people, but the whole community—(Hear, hear). I call upon Mr. Zingler and Mr. Coles to respond to this toast.

Mr. M. Zingler, F.C.S.—I do not think I could add anything to the beautiful opinions expressed by those who have spoken. I agree with Mr. Spagnoletti that, however much a man may be identified with science, he can never have his invention without a practical knowledge and ability, and that no invention can be called good unless it has stood the test of hard work—(Hear, hear). I think that every scientific man is a dreamer unless he can apply his science to the test of practical knowledge. And it falls very hard on any scientific man when he has not the means of carrying out his ideas in a practical way; and I do not hesitate to say that the fees exacted for patents are a stumbling block to the proper development of a man's abilities, for the reason that he is prevented from practically showing what he actually can do; and, therefore, I think that everything the Institute has done and is doing to amend the Patent Laws is of great benefit, and may prove eventually of the greatest boon to the whole community—(Cheers).

Mr. Coles, in responding, said—I feel the Chairman has placed me in a very difficult position, as he has associated my name with the work in which I am engaged. I think you will find that there is a very large margin for effecting a saving in fuel, and I think there is a large field for inventive genius—(Hear, hear). In the case of the exhibition spoken of many novel principles will be recognised. The use of gas as a heating agent will be shown, and the latest developments of electric science as applied to heating; and Dr. Siemens's stee lmetal furnace will also have a prominent place. There will likewise be on view an exhibition of hydrogen gas, which will be there manufactured and applied for cooking purposes. There will also be speed gas engines with ordinary coal motors. Beyond these things there will be an opportunity of testing anything that any inventor may desire to submit to proof—(Hear, hear).

The Chairman, in calling upon Admiral Selwyn to render an account of his visit to Paris to represent the Institute at the International Patent Law Congress last year, said that there was no doubt that he would be able to prove that that was the great question of the day for all political economists to exercise their faculties upon to elucidate and solve.

Subsequently the toast of the Council of the Inventors' Institute was proposed by Mr. W. Holland and responded to by Mr. F. H. Varley, and drunk with enthusiasm. The health of the Dinner Committee was next proposed by Mr. N. Wilson and responded to by Mr. T. Morgan, and after a little musical melange the evening's entertainment came to a pleasant close.

WELDLESS RING PLATES FOR BOILERS.

Mr. J. Windle, of Manchester, has designed a mill to roll weldless ring plates for boilers from two feet diameter up to fourteen feet, and four feet wide. The object of the invention is to avoid the longitudinal seams in boilers, which are necessarily a source of weakness, and this is accomplished by constructing the shell of the boiler of metal rings connected together, and formed by a rolling operation from an ingot of steel, or from a bloom or mass of metal, in a similar manner as when rolling railway tiers, the ring being formed without a joint, seam, or weld. In the rolling mill which has been specially designed for this work, a fixed and a movable roller, adapted to roll the required rings, are employed. The axles of these rollers are provided with top bearings, and to enable the ingot ring or mass of metal to be placed in position and the rolled ring to be removed, the upper bearing of the movable roller is arranged to be withdrawn. This bearing is fixed on the outer end of a lever or lever frame, which is hinged to a sliding standard or carriage connected with the carriage which carries the movable roller, the sliding standard being actuated by means of hydraulic cylinders. Vibrating frames are also employed, each carrying two, three, or more rollers in place of one, the upper ends of the studs or shafts being stayed. A number of the carrying rollers are converted, by means of bevel or suitable gearing, with revolving shafts, so that they assist in the carrying round of the ring. In working out this method of rolling a hole is punched in the ingot or bloom, and a mandrel introduced. The mass of metal, with the mandrel in position, is then placed under a steam hammer in a swage, which is formed to confine the metal sideways, so as to produce an extension of the length under the blows of the hammer until a rough cylinder of sufficient length is obtained, but in some cases the ingot is cast in the form of a hollow cylinder, which, when necessary, is elongated in the manner above indicated. These ring plates can be produced in any required shape, and with flanged thickened edges if necessary, and we understand that a company is being formed to put down the necessary plant for the manufacture of boilers and plates on this principle.

New Method of Preparing Chlorine.—J. Townsend, of Stassfurt, prepares chlorine by mixing a heated solution of magnesium chloride of 40° to 53° Baumé with about 10 per cent. of manganese dioxide, and then exposing it to the action of heated air, whereby the chlorine is liberated, which may be used in the ordinary manner. The process is facilitated by the addition of 25 to 50 per cent. of calcium chloride.—*Dingler Poly. Jour.*

Melbourne Exhibition.—The jurors have recently published the list of awards for (1) printing, (2) book-binding, and (3) publications, and in each of these classes Blackie and Son, publishers, London, Glasgow, Edinburgh, and Dublin have been awarded First Order of Merit. The competition included the publishers of Great Britain, America, and the Continent, and it is a noteworthy fact that Messrs. Blackie and Son are at the head of the list in each class of awards.

Proceedings of Societies.

ROYAL SOCIETY.

Nov. 17.—Mr. W. Spottiswoode, President, in the chair.—The following papers were read: "Preliminary Note on the Photographic Spectrum of Comet *b*, 1881," by Mr. W. Huggins,—"Note on the Reversal of the Spectrum of Cyanogen," by Profs. Liveing and Dewar,—"The Sun of the Series of the Reciprocals of the Prime Numbers and of their Powers," by Mr. C. W. Merrifield,—"Further Note on the Minute Anatomy of the Thymus," by Mr. H. Watney,—"On the Production of Transient Electric Currents in Iron and Steel Conductors," by Prof. Ewing,—"Experimental Researches on the Propagation of Heat by Conduction in Bone, Brain-tissue, and Skin," by Dr. Lombard,—"On Allotropic or Active Nitrogen, and on the Complete Synthesis of Ammonia," by Mr. G. S. Johnson,—"On the Comparative Structure of the Brain in Rodents," by Mr. W. B. Lewis,—"The Prehensores of Male Butterflies of the Genera Papilio and Ornithoptera," by Mr. P. H. Gosse,—"On the Propagation of Inhibitory Excitations in the Medulla Oblongata," by Dr. H. Kronecker and Mr. S. Meltzer,—"Researches on Chemical Equivalence," Parts IV. and V., by Mr. E. J. Mills,—and "On the Refraction of Plane Polarised Light at the Surface of a Uniaxal Crystal," by Mr. R. T. Glazebrook.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

Nov. 16.—Rev. S. M. Mayhew in the chair.—The discovery of a Roman villa, evidently of considerable extent, at Wingham, Kent, was announced. Aided by a grant from a Kent Society, the villa is being excavated by Mr. Dowker, and already three rooms with tesselated pavements have been uncovered, while a fourth has a hypocaust. Funds are needed for the prosecution of the researches.—Mr. L. Brock also reported the efforts made by the Association with respect to Stonehenge since the meeting there last year, and read a letter from Sir E. Antrobus, the owner, who disclaimed all intention of "restoration" in the works undertaken there by him. These are but for the safety alike of the monument and the visitors. Nothing permanent will be done until the spring.—In the discussion which followed many speakers referred to the somewhat unfair remarks that have been made with respect to the intentions of Sir E. Antrobus, whose efforts to uphold Stonehenge deserves thanks from antiquaries.—Mr. Way exhibited some mediæval pottery from Southwark; the Rev. S. Maude a unique denarius of Gallienus with the name of Germanicus on the reverse; and Mr. R. Soames a drawing of remarkable sculpture in Brixworth Church: it is called an eagle, and is supposed to have been brought from the Roman villa which existed close to the building where it is now built into one of the walls.—Mr. G. R. Wright exhibited some drawings of Mulgrave Castle, Yorkshire, and described some of its curious windows.—The first paper was "On the Bourg ez Ziffur, Cairo," by Prof. H. Lewis. This is one of the angle bastions of the wall of Cairo, now almost covered by sand. It has an octagonal central chamber, 26 feet in diameter, formed of recently cut stone. It dates probably from the time of Saladin.—Mr. J W. Gower, in the discussion which followed, alluded to the appearance of the pointed arch in a developed state here, and to the magnificent museum of Egyptian antiquities at Boulak.—The second paper was by Mr. M. Hills, and was on the measurements of Ptolemy applied to the northern part of Britain. He identified Hornsea Lake, east coast of Yorkshire, as Ptolemy's Portus Sinus, and Penrith as the starting-point of the tenth Iter. Salava, the second station, he placed at Gallaber, near Tebay.

NUMISMATIC SOCIETY.

Nov. 17.—Dr. J. Evans, President, in the chair.—Mrs. Bagnall-Oakley and Messrs. E. K. Burstal, W. Dawson, J. Jennings, W. Lees, and J. Doyle-Smithe were elected members.—Mr. Krumbholz exhibited proofs in silver of the Prussian silver coinage of 1867, a Roumanian marka of 1874, a re-struck Brazilian dollar, and a specimen of the Hamburg Jubilee medal of 180[illegible].—Mr. J. J. Nunn exhibited a groat of Henry VI. with a mark resembling the Arabic numeral 4 after the king's name.—Mr. Vaux exhibited a gold medal bearing the name of the Society for the Translation of Oriental Literature, which he supposed to have been presented by William IV. to Prof. H. H. Wilson.—Canon Powell exhibited, on behalf of Dr. Frazer, of Dublin, two base testoons of Edward VI., one with the mint-mark on both sides, a harp. 1552, found in Ireland, the other, very rare, with the lion mint-mark. The first of these coins is counter-marked with the grey-hound, according to the proclamation of Elizabeth (September 27th, 1560). Canon Pownall also exhibited three base testoons of Edward VI. from his own cabinet, one having the bolt mint-mark, 1549, counter-marked with a portcullis, as ordered by a subsequent proclamation of Queen Elizabeth (October 9th, 1560), and two with the harp mint-mark and Lombardic lettering, weighing respectively 67 and 53·5 grs. These have been submitted to assay by Messrs. Johnson, Matthey, and Co., of Hatton Garden, and found to contain no silver in any appreciable quantity, and to consist chiefly of tin and copper. With reference to these coins Canon Pownall quoted an extract from King Edward's diary, under date June 10th, 1552, as follows:—"Whereas it was agreed [*i.e.* on May 18th above] that there should be a pay now made to Ireland of £5,000., and then the money to be cried down, it was appointed that 3000 weight which I had in the Tower should be carried thither and coined at three denar fine, and that incontinent the coin should be cried down." Canon Pownall remarked that if His Majesty did not mistake as to his "three denar fine" this was a coinage infinitely more base than any ever before devised, three parts only in 240 (according to the usual mode of estimating the fineness of silver by the pound weight) being fine, but that, whatever may have been the fineness of the coins, the manner of conducting the transaction was highly disgraceful.—Mr. W. Bramsen read a paper on Japanese iron money, in which he traced the history of the coinage of Japan from A.D. 708 to the present year.

STATISTICAL SOCIETY.

Nov. 15.—Mr. J. Caird, President, in the chair.—The subject of Mr. Caird's opening address was the "British Land Question."—The Society's Howard Medal of 1881 was presented to Dr. F. Pollard, of Liverpool, for his essay on "Jail Fever."

LINNEAN SOCIETY.

Nov. 17.—Sir J. Lubbock, Bart., in the chair.—The meeting having been made special, Sir J. Kirk was elected into the Council, and Mr. F. Crisp elected Treasurer, to replace Mr. F. Currey.—Mr. G. Murray exhibited (for Col. Turberville) a bough of *Pinus pinaster* with suppressed internodes of the lateral branches, the result of injury to the axis from which they sprung.—Dr. F. Day showed examples of the stomachs of the pilchard with special reference to their digestion. These fishes come in shore on the Cornish coast towards night to feed, when they are netted. Examination shortly after reveals the zoëa stage of crustaceans to be their chief food. While this lies loosely in portions of the stomach, at the pyloric division it appears to be enclosed within a sac, or sausage-shaped envelope. Microscopic examination proves the sac to be a cast-off lining of the stomach walls. What purpose it serves in the economy of digestion is uncertain, though it bears resemblance to the sac vomited by hornbills during incubation. Mr. R. J. Lynch exhibited and read a note on the contrivance for self-fertilisation in *Roscoea purpurea*. Here, as in Salvia, a lever specialised from the anther, with the filament acting as a fulcrum, brings the pollen in contact with insects entering the flower.—Sir J. Lubbock read his ninth communication "On Ants, Bees, and Wasps." He commenced by detailing some experiments made with a view of ascertaining not only whether bees could distinguish one colour from another, but also whether they preferred certain colours. Under precisely similar conditions he placed drops of honey on papers of different colours, having accustomed marked bees to come to the spot for food. He then placed these pieces of paper on the lawn. When the bee returned and had sipped the honey for about a quarter of a minute he removed it. She then flew to a second colour; this he took away. Then she went to a third, and so on. In this manner he induced her to visit all the drops successively; and by recording a large number of observations, he ascertained for which colour the bees showed a preference. The result was that the bee seemed to like blue much better than the other colours. It may be asked why it is that, if blue is the favourite colour of bees, and if bees have so much to do with the origin of flowers, there should be so few blue ones. He suggests the explanation to be that all flowers were originally green, and then passed through white or yellow, and generally red, before becoming blue.—Mr. C. B. Clarke brought to notice a Hampshire orchis not figured in English botany. It is pale flesh-coloured, and allied to *O. latifolia*, but with denser cylindric spike. It proves it to be the true *O. incarnata*, Linn., that described by Syme and Babington under this name being the *O. Latifolia*, Linn.—Prof. Cobbold described a new Entozoon from the ostrich, named by him *Stronglus Douglasii*. It is said to prove destructive to ostrich chicks at Grahamstown and elsewhere in South Africa. It somewhat resembles certain free nematodes, but bears few eggs.

ZOOLOGICAL SOCIETY.

Nov. 15.—Prof. W. H. Flower, President, in the chair.—The Secretary read a report on the additions made to the menagerie between June and October.—Prof. Newton exhibited a specimen of *Emberiza rustica* recently shot on the coast of Yorkshire.—Canon Tristram exhibited and made remarks upon skins of a Darter and a Pigmy Cormorant, procured in June of this year on the Lake of Latioch.—Mr. Sclater exhibited a specimen of the Glossy Ibis (*Plegadis falcinellus*), belonging to Sir H. Mildmay, Bart., which had been shot in Hampshire, in September last.—Letters and communications were read: from MM. L. Taczanowski and J. Stolzmann on the habits and various plumages of the rare humming-bird *Loddigesia mirabilis*,—from M. L. Taczanowski on two newly allied species of humming-birds of the genius Steganura from Peru, which he proposed to call *Mustela Stolzmanni*,—by Mr. W. A. Forbes on the structure of the palate in the Trogons (Trogonidæ), and on the systematic position of *Eupetes macrocercus*,—from Mr. E. P. Ramsey on the true habitat of *Pynoptilus floccosus*, Gould,—from Mr. E. L. Layard on the South African mollusk *Cœliaxis Layardi* of Angas,—from Mr. E. A. Smith on the shells of the genus Chilina, with a list of the known species,—by Mr. A. G. Butler on some butterflies from Japan, with which were incorporated notes and descriptions of new species by Mr. M. Fenton,—and by Mr. H. J. Elwes on the butterflies of Amoorland, Japan, and Northern China.

IRON PERMANENT WAY.

By C. Wood, M.Inst.C.E.

In this paper, read at a recent meeting of the Institution of Civil Engineers, it was stated that, on the Continent, both longitudinal and transverse or cross iron sleepers had been in use for many years, there being 1,100 miles of the former, and 770 miles of the latter system. At numerous ironworks abroad, complete plant existed for their manufacture, whilst at the stations along the lines stacks of iron sleepers were as common as timber ones in this country. Of late the drain upon the forests had begun to tell upon the cost of wood sleepers, and the short duration of the timber, compared with what obtained in England, owing to the greater variation in the climate, largely accounted for the progress being made with wrought iron as a material for permanent way. The Prussian Government declared that, from an economical point of view alone, they were justified in making the change.

The author then proceeded to describe the various systems of longitudinal wrought-iron permanent way employed since its introduction by Mr. W. H. Barlow, Past-President Inst. C.E., in 1849. For simplicity of design his system had never been surpassed; and as a bearer his rail was unequalled. It possessed, however, elements of weakness, which stopped its progress, but not until many hundreds of miles had been laid. Some of these sleepers survived in sidings in England, and many miles were in use abroad after thirty years' service. The Macdonnell system laid upon the Bristol and Exeter Railway, after twenty-eight years' service, still carried the whole of the main-line traffic. The sleeper was a continuous longitudinal bearer, upon which the rail was held down by bolts, contact being prevented by the interposition of a packing or liner of pine wood. There had always been a difficulty in preventing the sleepers from canting. The nuts caused trouble by working loose, and the bolt ends had to be burred over to hold the nuts tight. The wrought-iron plates had suffered considerable corrosion, and broke at the bolt-holes and rail-joints. Mr. Bridges Adams brought out his suspended girder rail about the same time, but the bolts and nuts could not be kept tight, and were difficult to get at, and the road was harsh to ride over, and liable to cant. From 1855, when Mr, Adams laid his last trial length, up to 1878, no new wrought-iron permanent way had been tried in this country.

On the Continent, however, particularly in Prussia and in Belgium, progress had been continuous. The first experimental length of longitudinal way was laid in 1865 by Mr. Hartwich, upon the Prussian Rhenish Railway. In section it resembled the Vignoles rail, but with a deep web and a rather wide foot. This rested upon the ballast, and when first laid the preservation of the gauge was entirely dependent upon the ballast. It was soon found, however, that the line could not be maintained in order, and tie-bolts had to be employed. Even with this addition the road was not satisfactory, Following Hartwich, Scheffler in 1866 adopted a tripartite system for the Brunswick Railway, but the rail was weak, and caused trouble by lifting and breaking. To meet the difficulty Mr. Daelen introduced a modification in 1868; but in both sections the cost was great, constant attention was required to retain the bolts fast, and there was difficulty in adapting them to curves.

In 1867 Mr. Hilf laid a trial length of his longitudinal system upon the Ems and

Wiesbaden Railway. Its success rapidly led to further applications, and a length of about 900 miles had been laid. Hilf's longitudinal sleeper somewhat resembled Barlow's, but it had a central web. In the earlier sections the rail was of iron 4½ inches high, and weighed only 54 lbs. per yard. It was argued that as the sleeper and rail were firmly bolted together they would support each other, and that a light section of rail would suffice. The middle web under the sleeper not only materially stiffened it, but gave it a grip upon the ballast. In practice, however, the rails proved too light and too low. The flanges of the wheels came in contact with the gauge rods, so that in all the later sections the rails had been increased in weight to 65 lbs. per yard, and in height to 4 and seven-eighths inches. This additional strength in the rail had materially improved the road, The fish-plates were of great strength, having brackets on the bottom, and the joint of the rails was equal to 80 per cent. of their strength. One of the chief objections to its use was that the bolts and nuts were apt to work loose. Besides, the sleepers could not be bent to the curves, and had, therefore, to be laid in straight lengths with the rails in a curve on their top; consequently the sleepers had to be differentially punched to allow the bolts and clip-plates to catch the foot of the rail. For every yard of railway on this system, twenty-two separate pieces were required, not including rails. Objections had sometimes been made that the middle web split up and divided the ballast to an injurious extent, that it formed a gutter in which water collected, and that it added to the difficulty in rolling. A sleeper intended to overcome these objections had been adopted by the Prussian Rhenish Railway Company. It was a plain trough, free from ribs, and was said to lay more steadily upon the ballast than Hilf's. The fish-plates were not bolted to the sleepers like Hilf's later section, The sleepers were not fished, and the end of the rail overlapped the sleepers about 18 inches. The rails were 30 feet long, 5 and one-eighth inches high, and weighed 57 lbs. per yard.

In 1876, Mr. Hohenegger laid a few miles of wrought-iron sleepers upon the North Western Railway of Austria, the chief point of which was the greater depth of the sides, and a different mode of fastening upon the transoms. About the same date Mr. Heusinger von Waldegg brought out a fastening, in which the only bolts were for the fish-plates and transoms, the rails being held by wood keys and loose clips. Bridge-rails were preferably employed. Mr. Kirsch, Engineer to the Grand Central Railway of Belgium, introduced a sleeper in section somewhat resembling the Hilf, but deeper in the webs, more expensive to roll, and, from the number of loose pieces, one to be avoided. A more simple scheme by Dr. Winkler resembled Hartwich's deep rail, but the head of the rail was in parts—an objectionable device. The only other system which had achieved success was that of Mr. Haarmann. At first the rails were too light, but improvements had been made by Mr. Schwedler, of Berlin. The sleeper was 12½ inches wide, and had a raised box in the middle, with a groove upon the top to receive the foot of the rail. The rail was held by two cramp irons, clenched by a bolt passing through both cramp irons and the raised box-part of the sleeper. The wings of the sleeper were thin and elastic. The tilt was obtained by a malleable iron saddle resting upon a straight angle-iron transom. The sleepers were fished with a malleable iron plate, and held together by eight bolts. The rail joints overlapped the sleepers about 12 inches. The rail was 5 inches high, and strongly fished. In addition to the transoms, there were rods to assist in keeping the road in gauge. De Serres' and Battig's system, when first brought out, attracted notice from the simplicity of its parts. Several trial lengths had been laid in Belgium, Germany, and Holland. The system was one of the tripartite type, and the rail was gripped by the nipping action of the sleeper, which was tightest when the weight was upon it.

The first employment of wrought-iron cross sleepers was by Mr. Le Crenier, in 1860, who used a light channel iron, with the flanges downwards. They were 7 feet 10 inches long by 10 inches wide, and weighed 52 lbs. each. The rails were of the Vignoles section, placed directly upon the top, and were held down by fixed brackets bolted to the sleeper. In 1862 the Couillet Forge Company in Belgium tried some cross sleepers of girder section, 8 feet long and 7 inches wide, with shallow flanges, weighing 101 lbs. each. These were laid flat upon the ballast, the Vignoles rail being bolted upon them, bedded upon a cushion of hard wood. Both these systems were wanting in vertical stiffness, and the fastenings were deficient. In 1863 Mr. W. Barningham tried a short length as an experiment upon the Great Eastern Railway. The sleepers were of a circular trough shape, with a single wrought-iron jaw welded upon the top at each end. They were made to fit the double-headed rails adopted upon that line. Holes were punched in the rails at equal distances, and a single bolt through the rail and jaw formed the fastening. In 1864 Mr. Vautherin introduced his well-known cross sleeper, which had been tried on several French and Spanish lines. In form it was an inverted trough, the sides being inclined outwards. and each sleeper weighed 44 lbs., which proved to be too light. Those now being laid in Belgium were much stronger, and weighed 90 lbs. each; they were 6 feet 9 inches long, and the rail was fixed with gibs and cotters. The chief trouble had been with their fastenings. One of the latest cross sleepers, laid on the Bergisch Markisch Railway, resembled that of Hilf, but without the middle web; its weight was 98 lbs. The fastenings were of the Vautherin type, but were made heavier in steel and carefully fitted. On the same line there were also one hundred thousand wrought-iron sleepers of similar but heavier construction, weighing 126 lbs. each, which gave great satisfaction. The cost of the steel fastenings was about £20 per ton, and the sleepers came to about £6 10s. per ton at the works. The sleepers on this railway had their ends turned down to prevent end-shifting and the ballast working out. The Prussian Rhenish Railway Company employed a cross sleeper of rolled iron, somewhat similar to the Vautherin section, but with a narrow foot. The rail was fastened by bolts and clips; the bolts had tee heads, which passed through and turned round in the sleeper; and the clips, which were also of rolled iron, were so constructed that they partly dropped into the holes made for the bolts. Both the last-mentioned railway companies were now using sleepers of steel so soft that the ends were bent over in a cold state. The Dutch Rhenish Railway Company had adopted a similar section to that described last; but the tilt was obtained by placing a bevelled plate between the rail and the sleeper. Mr. Haarmann had introduced upon the Cologne-Minden Railway a cross sleeper, and, in order to get in the cramp fastenings employed upon his longitudinal system, he had inserted upon the top of the sleeper, immediately under the rail, a bevelled cast-iron block to give the required cant. The cramp-irons were of malleable cast iron. The cast-iron block was hollow, and had a tongue which fitted tightly into a hole in the top of the sleeper to keep it from shifting. The total weight of the sleeper was 119 lbs., including the fastenings. Mr. Haarmann's cross sleeper, like nearly all those previously mentioned, had the ends closed by a piece of angle-iron, on the supposition that this boxing in prevented the sleepers shifting endways, and the ballast from escaping at the ends, and that they then opposed the same resistance as timber sleepers; but the author was convinced that no benefit had been thereby derived.

In the author's system, as laid upon the North-Eastern Railway at Middlesbrough, the sleepers were 8 feet 6 inches long, by 11 inches wide, and ⅜ inch thick; the sides were inclined outwards, and were designed to hold and keep the ballast intact. The tilt was given by curving the sleeper as in the Vautherin and other systems. The fastening for the rail was a single piece of iron bent into a horseshoe shape, one end of which was hooked to hold the flange of the rail, whilst the other was carried up to form a jaw to take in a wood key as in an ordinary railway-chair. The chairs were of wrought iron rolled in bars the width of the clip required, the irregular thickness of which was arrived at by cutting away one of the rolls. These bars were afterwards sheared off into proper lengths, and bent into the required shape. The clip-chair, being of a horseshoe or bow shape, was elastic, and when a compressed wood key was driven in tight between it and the rail, the jaw being forced outwards, wedged the bow under the sleeper, and the spring thus produced maintained a constant pressure upon the key. The first rails had worn out and new rails of steel had been substituted, the same clips and wood keys being used again. If any alteration were made, it should be in strengthening the foot of the inclined sides; but so far the fastenings had proved satisfactory. For narrow-gauge light railways fixed clips were preferred.

At the Dusseldorf meeting of the Iron and Steel Institute in 1880, Mr. E. Martin introduced a sleeper of wrought iron with a cast-iron chair upon it. Holes were punched in the sleeper, through which the metal flowed and united in a plate underneath. Mr. Livesey's wrought-iron sleeper, now being introducted on some colonial metre-gauge railways, was made of sheet iron 3-16ths inch thick, heated and compressed in dies; each clip had two rivets or eight rivets to each sleeper, and the iron keys were corrugated to prevent them being jarred out. Mr. F. W. Webb had lately brought out a wrought-iron transverse sleeper for taking in the bull-headed rail of the London and North-Western Railway; the chairs were of steel, riveted to the sleeper.

The best ballast for wrought-iron sleepers was small broken stone or furnace slag, failing which small gravel or even coarse sand might be used; but it was essential that thorough drainage should be secured, to prevent suction into the hollow of the sleeper. It was stated that the corrosion of wrought-iron sleepers upon a moderately well-drained railway under traffic was very small. Finally, the author pointed out that a cross-sleeper road was more stable than a longitudinal one, and gave some statistics of the cost of iron and wood sleepers, showing the relative cheapness of the former.

THE INSTITUTION OF CIVIL ENGINEERS.

SUBJECTS FOR PAPERS.

Session 1881-82.

THE Council of The Institution of Civil Engineers invite communications, of a complete and comprehensive character, on any of the subjects included in the following list, as well as on other analogous questions. For approved Original Communications, the Council will award Premiums, arising out of Special Funds bequeathed for the purpose, the particulars of which are as under:—1. The Telford Fund, left "in trust, the Interest to be expended in Annual Premiums, under the direction of the Council." This bequest (with accumulations of dividends) produces £260 annually.) 2. The Manby Donation, of the value of about £10 a year, given "to form a Fund for an Annual Premium or Premiums for Papers read at the meetings." 3. The Miller Fund, bequeathed by the testator "for the purpose of forming a Fund for providing Premiums or Prizes for the Students of the said Institution, upon the principle of the 'Telford Fund.'" This Fund (with accumulations of dividends) realises £160 per annum. Out of this Fund the Council have established a Scholarship, —called "The Miller Scholarship of The Institution of Civil Engineers,"—and are prepared to award one such Scholarship, not exceeding £40 in value, each year, and tenable for three years. 4. The Howard Bequest, directed by the testator to be applied "for the purpose of presenting periodically a Prize or Medal to the author of a treatise on any of the Uses or Properties of Iron, or to the inventor of some new and valuable process relating thereto, such author or inventor being a Member, Graduate, or Associate of the said Institution." The annual income amounts to rather more than £16. It has been arranged to award this prize every five years, commencing from 1877. The next award will therefore be made in 1882.

The Council will not make any award unless a communication of adequate merit is received, but will give more than one Premium if there are several deserving memoirs on the same subject. In the adjudication of the Premiums no distinction will be made between essays received from any one connected with the Institution (except in the cases of the Miller and the Howard bequests, which are limited by the donors), or from any other person, whether a Native or a Foreigner. 1. The adoption of a Standard Test-piece for bars and plates. 2. The Mechanical and other Properties of Iron and Steel; and the effect produced by tempering Steel in oil and in water, with a description of the testing machinery. 3. The Behaviour of Iron and Steel under ordinary loads, and up to the limit of elasticity. 4. The methods of protecting Metal-work exposed to Corrosion, with examples. 5. The modern practice of Bridge-builing in Germany, especially with reference to the details of construction and the substitution of bar and angle iron for wide flange-plates. 6. The Action of High Winds on lofty and exposed structures, and the best methods for determining the force of the wind. 7. The Comparative Cost of Transport by land and by water. 8. The Works carried out on the Continent of Europe and in North America for the Improvement of Rivers, and of Inland Navigation generally. 9. The methods used for determining the Discharge of Rivers, with a description of the Floats and Current-Meters employed for the purpose. 10. River Conservancy:—including a description of the physical conditions of the district, and the cause, effect, and means of prevention of Floods. 11. The Location and Construction of the most difficult portions of the several Pacific Railroads. 12. The Elevated Street Railroads of New York. 13. Continuous Railway Brakes. 14. Mechanical Power on Tramways, including steam, compressed air, electricity, &c. 15. A Review of recent Hydraulic Experiments. 16. Investigation as to the Quality of Water yielded by the Chalk Formation. 17. The Analysis of Water for Potable Purposes, having special reference to the method of estimating "Previous Sewage Contamination." 18. The Design and Construction of Covered Service-Reservoirs for Town Water-Supply. 19. The Sewering of Towns on the separate system, by the exclusion of the surface waters. 20. The Utilisation of the Mechanical Power of the Tide and of the current of rivers, 21. The type of Steam-Engine best adapted for ordinary factory purposes, in respect to economy in first cost, and in cost of maintenance, as well as in the use of steam. 22. The best method of Testing Steam-Engines (independent of their boilers), having regard to accuracy of the results, and ease with which the tests can be carried out. 23. The modern practice in the design and construction of Boilers. 24. On Magneto-electric and Dynamo-electric Machines, with their relative advantages. 25. The Generation, Storage, and Transmission of Electric Energy, the purposes to which it may be applied, and the sources of loss. 26. The methods and appliances for Storing, Weighing, and Delivering Grain in and from Granaries. 27. The various systems of Grinding Wheat, and the Machines used in Corn-Mills. 28. The different systems of Refrigerating Machinery, and appliances for the preservation and transport of provisions. 29. The Utilisation of Waste Products in different manufacturing processes. 30. The Methods and Machinery employed for separating the impurities from coal as carried out in South Wales, in connection with the manufacture of coke for the iron and steel trades. 31. The application of Hydraulic Power to Machine Tools. 32. Drilling and Riveting Machinery for Girder work. 33. The different systems of Lifts in use in Warehouses and in Dwellings, 34. The latest development of the Compound Marine-Engine. 35. The special Construction of Vessels for the reception of Railway-Trains on Deck, indicating the arrangements for the shipping of such trains on their own wheels at various states of the tide. 36. The Methods and Machinery employed in Sinking and in Working deep Coal-Mines. 37. Coal-Depots for Ocean Steamers, the various points involved in their management, and the preservation of the coal from deterioration. 38. The Methods employed in securing large and irregular-shaped mineral workings, for example—the Almaden Mines, the Great Comstock Lode, &c. 39. The Manufacture of Lead and the Extraction of Silver. 40. Instruments for measuring the Velocities of Vehicles, of Prime Movers, and of Wind and Water-Meters. 41. The Distribution of Heat over large areas from a central source of supply. 42. The Methods and Appliances for Blasting Rock under Water. 43. The Management of Underground Waters in mining districts, and the relative economy of distributed or trunk pumping engines, adits, &c., in particular cases. 44. On proportioning Mains for the distribution of Water and of Gas, 45. Forces and Strains of Recoil considered with reference to the Elastic Field-Gun Carriage.

The Essays should be written in the third person, and be legibly transcribed on foolscap paper, on one side only, leaving a margin on the left side, in order that the sheets may be bound. Every Paper must be prefaced by an Abstract not exceeding 1,500 words in length. Illustrations, when necessary, should be drawn on tracing paper, to as small a scale as is consistent with distinctness, and ready to be engraved. When an illustrated communication is accepted for reading, a series of Diagrams will be required sufficiently large and boldly coloured to be clearly visible at a distance of 60 feet. These diagrams will be returned. Papers which have been read at the Meetings of other Societies, or have been published in any form, cannot be read at a Meeting of the Institution, nor be admitted in competition for the premiums. The communications must be forwarded to the Secretary of the Institution, from whom any further information may be obtained. There is no specified date for the delivery of MSS., as when a Paper is not in time for one session it is dealt with in the succeeding one.

PREMIUMS AWARDED.

Session 1880-81.

The Council of The Institution of Civil Engineers have awarded the following Premiums:—

FOR PAPERS READ AT THE ORDINARY MEETINGS.

1. George Stephenson Medals, and Telford Premiums, to Thomas Forster Brown and George Frederick Adams, M.M. Inst. C.E., for their Paper on "Deep Winning of Coal in South Wales." 2. A Watt Medal and a Telford Premium, to John Issac Thornycroft, M. Inst. C.E., for his Paper "On Torpedo-Boats and Light Yachts for High Speed Steam Navigation." 3. A Telford Medal, and a Telford Premium, to Theophilus Seyrig, M. Inst. C.E., for his Paper on "The Different Modes of Erecting Iron Bridges." 4. A Telford Medal and a Telford Premium to Max am Ende, Assoc. M. Inst. C.E., for his Paper "On the Weight and Limiting Dimensions of Girder Bridges." 5. A George Stephenson Medal, and a Telford Premium, to Benjamin Baker, M. Inst. C.E., for his Paper on "The Actual Lateral Pressure of Earthwork." 6. A Telford Premium to Richard Henry Brunton, M. Inst. C.E., for his Paper on "The Production of Paraffin and Paraffin Oils." 7. A Telford Premium, to Charles Colson, Assoc. M. Inst. C.E., for his Paper on "Portsmouth Dockyard Extension Works." 8. A Telford Premium, to Christian Hendrick Meyer, Assoc. M. Inst C.E., for his Paper on the "Temporary Works and Plant at the Portsmouth Dockyard Extension." 9. A Telford Premium, to Benjamin Walker, M. Inst. C.E., for his Paper on "Machinery for Steel-making by the Bessemer and the Siemens Proceses." 10. The Manby Premium, to Joseph Prime Maxwell, Assoc. M. Inst. C.E., for his Paper on "New Zealand Government Railways."

FOR PAPERS PRINTED IN THE PROCEEDINGS WITHOUT BEING DISCUSSED.

1. A Telford Medal, and a Telford Premium, to Dr. J. Weyrauch, for his Paper "On the Calculation of Dimensions as depending on the Ultimate Working Strength of Materials." 2. A Telford Premium, to James Richard Bell, M. Inst. C.E., for his Paper on "The Empress Bridge over the Sutlej." 3. A Telford Premium to John Lewis Felix Target, M. Inst. C.E., for his Paper on "Experiments on a New Form of Module for Irrigation Purposes." 4. A Telford Premium to William Thomas Henney Carrington, Assoc. Inst. C.E., for his Paper on "Three Systems of Wire-rope Transport."

FOR PAPERS READ AT THE SUPPLEMENTAL MEETINGS OF STUDENTS.

1. A Miller Prize, to James Bernard Hunter, Stud. Inst. C.E., for his Paper on "Wood-working Machinery as applied to the Manufacture of Railway-Carriages and Wagons." 2. A Miller Prize, to Mathew Buchan Jamieson, Stud. Inst. C.E., for his Paper on "The Internal Corrosion of Cast-Iron Pipes." 3. A Miller Prize, to Thomas Stewart, Stud. Inst. C.E., for his Paper on "The Prevention of Waste of Water." 4. Miller Prize, to William Henry Edinger, Stud. Inst. C.E., for his Paper on "Brick- and Concrete and Concrete Gas-holder Tanks." 5. A Miller Prize, to Daniel Macalister, Stud Inst. C.E., for his Paper on "Caissons for Dock Entrances." 6. A Miller Prize, to Lindsay Burnet, Stud. Inst. C.E,, for his "Description of a Cargo-carrying Coasting Steam-Ship, with detailed investigation as to its efficiency." 7. A Miller Prize, to Edward Walter Nealor Wood, Stud. Inst. C.E., for his Paper on "The Improvement of the Old Harbour at Holyhead." 8. A Miller Prize, to Arthur Stuart Vowell, Stud. Inst. C.E., for his Paper on "Steel; its chemical constitution and behaviour under tensile strain." 9. A Miller Prize, to William Marriott, Stud. Inst. C.E., for his Paper on "Boilers."